

MDOT SUPPLIER QUALIFICATION PROGRAM



MDOT SUPPLIER QUALIFICATION STANDARD

FOR

STEEL HIGHWAY STRUCTURES

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for

STEEL HIGHWAY STRUCTURES

The Michigan Department of Transportation (MDOT) places a high value and importance on the dependability of suppliers providing steel highway structures.

MDOT believes that an effectively implemented, regularly maintained and regularly audited quality management system (QMS) is a key indicator of a Supplier's ability to produce a quality product on time. MDOT will accept products from suppliers who demonstrate a proactive QMS with procedures and processes that consistently deliver quality to MDOT. To assess that demonstration of quality, MDOT conducts assessments of the readiness of the Supplier's QMS to meet contract requirements for highway structures previously listed.

By implementing the requirements of this Standard consistently, MDOT projects can be produced and delivered with minimum error, deviations, and rework. This improves quality for MDOT and should provide profitability for the Supplier.

Suppliers will be listed as approved for use on MDOT projects as they complete and maintain the requirements of this program.

Prime contractors may choose from this Approved Supplier List with confidence that the Supplier has demonstrated both a functioning QMS and an understanding of MDOT requirements for this product.

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Commentary: Throughout this Standard, clarifications and examples have been provided to assist the Supplier in understanding the requirements. Commentary should be considered non-mandatory.

Program Rules

A. Scope

This requirement applies to Suppliers providing ancillary structures for MDOT projects for these supply types:

- Cantilever Sign Structures
- Overhead Truss Sign Structures
- Dynamic Message Sign Support Structures
- Traffic Signal Mast Arm Poles and Mast Arms
- Bridge Mounted Sign Connections (Aluminum and Steel).
- Tower Lighting Unit Structures

MDOT may apply this assessment requirement to other supply types using project specific special provisions

The scope of MDOT document reviews and MDOT audits include criteria specific to the Supplier's declared category. Contractors may only consider a Supplier for a MDOT project if they are listed for the specified products and services they wish to procure.

B. Definitions

Definitions are based on MDOT Special Provisions, MDOT Construction Specifications and industry codes and standards referenced by those MDOT documents. In case of a conflict in the contract documents, see Division 1 of the MDOT Standard Specifications for Construction for order of contract document precedence. Definitions offered here are specific to this Supplier qualification program and may not align precisely with some PCI publications or related industry documents.

CAR	Corrective action request or corrective action response.
Concern	Concerns may be related to accuracy, consistency, individual actions or other issues that could impact product quality, but do not yet constitute a nonconformance.
Correction	The measure(s) taken to eliminate a detected nonconformity (nonconforming product or process) by restoring conformance with specified requirements. It may be a reaction to a process parameter that is approaching an established QC acceptance limit.
Corrective Action	The action or actions undertaken to identify and eliminate the root cause of a product nonconformance or process nonconformance (or other undesirable situation such as a repetitive process control issue, a severe or repetitive procedural violation, a severe customer complaint, or an internal or external audit finding) to prevent its recurrence. Corrective action includes identifying the extent of nonconformity (quantity of affected product or materials, number of affected machines or instruments, etc.), containing the extent (like segregating, process interruption, personnel stand-down, etc.), correcting the nonconformity (see "Correction" above), identifying the root cause, and implementing long-term verifiable action to prevent recurrence.
Critical Nonconformance	A finding that directly affects and severely reduces the quality and acceptability of the product, possibly leading to premature failure, excessive maintenance, or diminished service life. Examples of critical nonconformance may include but are not limited to the following items, at a minimum, that are stipulated in the project specifications: Use of nonconforming material (defective, unauthorized, etc.), unauthorized modifications or substitutions, practices violating code or specification requirements, falsification of any record, absence of required documentation for critical items and unqualified individuals performing critical tasks.

Implementation (Of a quality procedure)	A quality procedure is implemented when the process is documented and maintained; responsible personnel are aware of their responsibilities in the procedure and the records generated by the procedure are executed. It is maintained when it is audited regularly and updated to meet changing requirements
Inspection and Test Plan (ITP)	That part of a quality control plan that defines detailed quality control activities performed by production, QC, and QA inspection, oversight, approvals, or hold points at specific steps. It is typically a separate document referenced by the quality control plan.
Maintained, QMS	A quality management system is maintained when it is regularly reviewed, audited and matches what the Supplier does to meet requirements.
Major Nonconformance	<p>Finding related to the QMS, which directly or indirectly affect production dependability and consistency, potentially leading to reductions in product performance, quality, and reliability.</p> <p>Examples of major nonconformance may include but are not limited to the following minimum items, required in the project specifications: unqualified employee(s), missing procedures, poor equipment condition leading to material or manufacturing nonconformance, material quality, drawing accuracy, vendor services and inadequate supervision.</p>
Minor Nonconformance	<p>Finding related to documentation shortcomings or other minor infractions within the system application that are not expected to cause multiple nonconformities or significant product deficiencies in current or future projects.</p> <p>Examples of minor nonconformance may include but are not limited to the following: Expired or incorrect calibration, inadequate training, specification(s) not current, missing procedure steps, minor product nonconformances and illegible identification.</p>
MDOT Program Manager	A managing engineer of the MDOT Bureau of Bridges and Structures – Structures Construction Section or designee with the decision-making authority for the program use and Supplier participants. The Program Manager functions on behalf of the Engineer in decisions about Supplier's capability to supply projects.
Program	<p>The MDOT Supplier Qualification Program</p> <p>This standard addresses the program requirements of the MDOT SUPPLIER QUALIFICATION STANDARD for STEEL HIGHWAY STRUCTURES</p>
QAI	Quality Assurance Inspector. Term used in this Standard to refer to MDOT's representative (sometimes called MDOT Shop Inspector) that is responsible for Quality Assurance inspections and has the authority to accept work that meets the contract requirements. The QAI is typically on site daily or at some lesser frequency to observe and perform sample inspections and tests to demonstrate conformity to project requirements on behalf of the Engineer.
QCI	Quality Control Inspector. Term used in this Standard to refer to the Supplier's inspector(s). The QCI is performing, and documenting measurements and tests required to demonstrate conformity to project requirements on behalf of the Supplier.
Quality Assurance (QA)	Activities administered by MDOT's quality assurance inspector (QAI) dealing with acceptance of the product, including, but not limited to, materials selection, sampling, testing, fabrication inspection and review of Supplier QC documentation.
Quality Control (QC)	All activities administered by the Suppliers' quality control inspector (QCI) to monitor, assess, and adjust production and fabrication processes to ensure the final product will meet the specified levels of quality. Including, but not limited to training, materials selection, sampling, testing, project oversight and documentation.
QC Manager	A properly qualified employee of the Supplier responsible for developing and implementing all aspects of quality control for the Supplier's quality management system. This includes, but is not limited to inspection, training, equipment selection,

	<p>sampling, testing, preparing ITPs, determining the qualifications of and managing QC personnel, communicating routinely with the production personnel to ensure quality, initiating corrective action and suspending operations (stop work authority) when the process is found to be producing non-conforming materials, preparing and submitting all necessary QC documentation to the MDOT QAI or MDOT Program Manager as required by contract and within the specified time period.</p> <p>Note: the duties may be separated in some Supplier quality management system systems into their own quality assurance manager or function meeting AISC or other certification system.</p> <p>Note: For the clarity in this Standard, requirements and references to QA management, inspection and activities are performed and controlled by MDOT and designated MDOT consultants.</p>
QMS	<p>Quality Management System – The Supplier’s documented procedures, instructions, reviews, records, and requirements used to meet the requirements of this Standard and contract requirements maintained and implemented.</p>
RFI	<p>Request for Information</p> <p>RFIs referred to in this document are formal written communications initiated by the Supplier to the Owner or through the Contractor to the Owner, requesting clarification, missing information, or approval of an alternate solution to fabrication from the design drawings or approved fabrication and erection drawings.</p>
Repairs	<p>Work to bring a nonconforming element, aspect, or characteristic to project conformance.</p>
Supplier	<p>Capitalized in this Standard, the term refers to the fabricator or manufacturer who is seeking the opportunity to provide products and services to MDOT for a specific project. Contractors awarded MDOT projects select only qualified Suppliers for the work listed on the ASL (Approved Supplier List).</p>

C. Requirements for Participation

The Supplier must successfully complete an MDOT QMS assessment prior to the start of fabrication/manufacture in accordance with this Standard. The Supplier must also maintain current certification and compliance with the requirements of the appropriate American Institute of Steel Construction (AISC) fabrication category or endorsement.

- Metal Component Manufacturer (CPT).
- The *Complex Coating Endorsement (CCE)* is required for Highway Structures that are coated with liquid coatings when the liquid coated steel surface areas are greater than 500 square feet.

When HDG (hot dip galvanized) coating is required by project specifications the Supplier, or their subcontract supplier must meet the qualification requirements of this audit program:

- MDOT Process Control Audit – Hot Dipped Galvanizer.

There is no charge to participate in the program. However, any costs incurred by the Supplier to participate in the QMS assessment will not be paid for by MDOT. These costs include the Supplier’s time, labor, and materials to provide the requested documentation and participation in the onsite audit and the resolution of identified nonconformances.

What we Audit

The Supplier’s implementation of the requirements defined in each numeric clause of this standard 1-20 are sampled during the onsite audit. The requirements of Supplier projects or orders that are entering the organization, in process and recent past completed are sampled for compliance. In the absence of MDOT work, projects or orders from other agencies can be used to demonstrate the implementation of the quality management system. Items specific or unique to MDOT work are not expected to be implemented in other State’s DOT projects.

Audit requirements

There are two steps to the assessment process, the Documentation Audit, and the Onsite Audit.

D. Documentation Audit

A full review of the Supplier's QMS documentation will be conducted remotely by MDOT auditors. The Supplier must resolve critical and major nonconformances from this review prior to scheduling the onsite audit.

All document review nonconformances must be resolved prior to granting Supplier approval. If any nonconformances are found during the documentation audit, the audit team will attempt to resolve and close them with the Supplier during the documentation audit and before the onsite audit. Some items or issues may be left for verification during the onsite visit.

DOCUMENTATION SUBMISSION REQUIREMENTS

Suppliers submit QMS documentation for review and assessment, as soon as possible, to allow for a successful assessment. It is in the Supplier's best interest to submit the requested documentation in a timely fashion, as nonconformances must be resolved before the onsite audit is scheduled.

Submit the QMS documentation in a searchable PDF file, in the smallest file size possible. If possible, submit the entire documentation in one PDF file. **Hard (paper) copies are not accepted.**

Include one sample of the following records completed with sample or actual data. As with all evidence gathered during the onsite audit, records submitted for documentation audit are considered confidential. It is highly recommended to redact business sensitive data such as prices, hours, and estimated number of personnel from actual project records prior to submittal. Quality documents (the Quality System Manual and related procedures and forms) should be submitted complete and without redaction (except for sensitive information as noted above). Other special accommodations will be considered upon request.

Documents required for review prior to the onsite audit as part of the document review process:

Submit for the documentation audit:	
	Procedures or other documents covering the program elements (i.e. – the quality manual)
	Sample completed records that support program elements of this Standard:
S1	Project Specification Review Record
S2	Sample shop drawing of a representative member that is typical of the product(s) to be supplied to MDOT
S3	Sample detailing standard or approved template
S4	Purchase Order (PO) form or other purchasing document that defines purchasing requirements for: Steel or aluminum shapes or plates High strength bolts, nuts, washers, and anchor rods Welding consumables Coatings Contracted services such as detailing, NDT, or galvanizing Buy America requirements for applicable materials

S5	<p>One sample set of QC record(s) for production:</p> <ul style="list-style-type: none"> ▪ Verification of received material ▪ Final inspection record including: <ul style="list-style-type: none"> ▪ Dimensional ▪ Welds ▪ Coatings (including surface preparation) ▪ Bolting (if work requires shop installation) ▪ Repairs ▪ NDT
S6	One sample job specific quality plan or ITP (completed)
S7	<p>One sample set of bolt testing QC records:</p> <ul style="list-style-type: none"> ▪ Pre-installation verification (PIV) test for shop installed bolts ▪ Manufacturer's test records
S8	Weld machine verification log/record
S9	Procedure Qualification Test Records, one (1) for each process in accordance with AWS D1.2 or D1.5 as category qualification requires.
S10	<p>Welding Procedure Specifications, one (1) for each process in accordance with AWS D1.1 Structural Welding Code—Steel, AWS D1.2 Structural Welding Code - Aluminum or AASHTO/AWS D1.5 – Bridge Welding Code as category qualification requires.</p> <p>Show evidence of MDOT approved WPSs or submit WPSs for preapproval. (Will be evaluated during the onsite audit and during shop drawing preapproval)</p>
S11	<p>Welder Qualification Test Record, one (1) for each process in accordance with AWS D1.1 Structural Welding Code—Steel, AWS D1.2 Structural Welding Code—Aluminum, or AASHTO/AWS D1.5 – Bridge Welding Code as category qualification requires</p> <p>Also, show evidence of completing/meeting the MDOT Welder Qualification Program.</p>
S12	<p>Certifications for all personnel holding these credentials who will work on MDOT projects (one sample each):</p> <p>AWS QC-1 Certified Welding Inspector</p> <p>ASNT TC-1A Level II NDT Certification for each method performed in the fabrication plant.</p>
S13	Calibration (inspection and test equipment) log or record sample (showing accuracy, frequency and measured deviation)
S14	Nonconformance report or log with data to demonstrate how it is used.
S15	Correction Action form, record, or log with data to demonstrate how it is used.
S16	Internal Audit Record – the most recent with data to demonstrate how it is used.
S17	Management Review Record or minutes from one or more meetings addressing the items in QMS Review
	<p>Job Descriptions and Evidence of Qualification</p> <p>Include job descriptions and documented evidence of qualification for key personnel as identified in the Supplier organizational chart, including QCIs. Documented evidence of qualification includes certification records, training history with supporting records, and a written record of work experience, preferably verifiable, which supports the responsibilities and authorities detailed in the job description.</p>

Organizational chart of key personnel showing reporting relationships and highlighting QC reporting and access

E. Onsite Audit

The onsite audit will be scheduled after successful completion of the documentation audit. An onsite audit can be scheduled within 21 days if project status is critical. Contact the MDOT Program Manager for this special accommodation.

The audit team will work to avoid disruption to ongoing production as much as possible. However key personnel participation will be necessary to complete the work.

Successful Audit

All nonconformances identified during the onsite audit must be addressed satisfactorily to consider the onsite audit successful. The Supplier must resolve critical and major nonconformances from this audit before qualification is achieved and the Supplier is listed on the ASL.

The results of the onsite audit are reviewed by the MDOT Program Manager.

A successful audit is achieved when all elements of the Supplier's QMS documentation are found compliant or commendable and systems are effective at controlling the quality of product and the processes to produce them.

If nonconformances are found during the onsite audit, the audit can still be successful if each is addressed and closed by the due date assigned by the auditor or before fabrication begins with permission by the MDOT Program Manager. If critical or major nonconformances are not resolved before the start of fabrication, additional inspections or audits may be imposed by the MDOT Program Manager until they are closed.

- ✓ **Commentary:** Expected audit cycle for maintaining approval status is annual. MDOT may however schedule recurring audits more frequently depending on past audit performance.

Work in process

The fabrication functions typical of the category(s) the Supplier is qualifying for must be in process and observed for the onsite audit. If the applicant Supplier has no work in house, appropriate exercises or mock work will be determined for demonstration. Notification of a "no work situation" must be received at least 21 days before the scheduled onsite audit to allow for adequate preparation and planning for both the auditor and the Supplier.

Access and Objective Evidence

The Supplier agrees to allow access to all projects active at the time of an audit that use processes similar to those that will be used on MDOT work. Auditors will assess the Supplier's control of quality and implementation of the Supplier's own procedures for conformance with project specifications to demonstrate an effective system. Unique requirements of the MDOT specifications or project special provisions will not be assessed on non-MDOT projects. However, Suppliers must have procedures in place and have knowledgeable personnel and equipment to demonstrate capability for any unique MDOT requirements.

The onsite audit will confirm objective evidence of compliance through observation, review of quality documents and interviews with responsible personnel. Copies of documents and photos of work may be collected as objective evidence and made part of the confidential report. It is understood that the Supplier may wish to redact business sensitive data such as prices, hours, agreements, and other proprietary items before making scans or producing digital copies.

Proprietary procedures and information cannot be withheld from the audit process if they are needed to demonstrate compliance with the requirements of this Standard. All audit team members have a signed Confidentiality Agreement on file.

If the audit team schedule is impaired or it is prevented from completing the audit, the elements not sampled will be considered nonconforming.

- ✓ **Commentary:** The intent of the requirement is to motivate the Supplier to schedule work and communicate with MDOT auditors, so all elements are sampled. Unacceptable impairment includes but is not limited to: a) vacationing key personnel without adequate support to cover, b) plant shut-downs without notice, c) lack of materials, d) access to ongoing projects and project information potentially for other agencies. f) access to documents or processes identified as proprietary by the Supplier. On a case-by-case basis, MDOT auditors will recommend to the MDOT Program Manager halting the audit and rescheduling in lieu of issuing nonconformances.

Key Personnel

Please arrange access for the audit team to these functional positions for the onsite portion of the audit. Certifications and qualifications will be verified during the onsite audit. The audit may include managers responsible for the review and effective implementation of the QMS including specification review, design, document control, ID and traceability, fabrication process control, inspection, and the quality management system processes of nonconformance, corrective action, internal audits and training. Assure that these personnel are represented in the organizational chart.

- QCI
- Welding Technician(s) performing welding documents preparation
- QC Management
- Detailing Staff
- Detailing Management
- Purchasing Management
- Production Management– Managers, supervisors, welders, receivers
- Management Representative and management team members

F. Required Demonstrations

	Material receipt, identification, and documentation process
	Fixturing, preparation and welding of longitudinal seam welds for mast arms and poles for lighting, signal, and sign structures.
	Production <ul style="list-style-type: none"> ▪ Demonstrate production set up considering final load case of the deflected structure (for all categories except tower lighting) ▪ Perform sample or production welding process in accordance with an MDOT approved WPS.
	QCI inspections <ul style="list-style-type: none"> ▪ Dimension verification ▪ Visual weld inspection ▪ Inspections of camber in the unloaded condition (for all categories except lighting structures and bridge mounted sign structures) ▪ Perform sample NDE inspection and documentation using the MT and UT process per written practice and process procedure reviewed by MDOT SFU.
	Surface Preparation and Coating Application Acceptance
	Surface Preparation and Coating Application
	Show evidence of MDOT approved WPSs applied in MDOT template shop drawings

G. Audit Team

The team may be single auditor or multiple personnel to assess a Supplier depending on:

- Size of the facility
- Number of employees and number of shifts
- Observation of the Audit process by auditors or MDOT personnel
- Complexity of the Supplier's QMS
- Complexity of the audit scope or assignment from MDOT.

H. Audit Termination

This is not anticipated; however, the Auditor may terminate the audit immediately for the following reasons:

- Safety
- Refusal of access to product or documentation including non MDOT work needed to demonstrate capability
- Significant breakdown of the QMS

I. Nonconformances (found during MDOT audits)

Nonconformances discussed here refer to written observations backed by objective evidence and issued officially by MDOT. A definition of each type of nonconformance can be found in the Definitions section of this document. Suppliers' definitions may differ; however, the following will apply to nonconformances issued by MDOT regardless. Suppliers' resolve these nonconformances using their internal corrective action process. Send responses to MDOT using the forms provided by MDOT.

See Figure 1 in the mandatory document annex for more detailed requirements

Critical Nonconformance

The Supplier must respond to critical nonconformances within 7 calendar days from receiving formal notification of the findings by MDOT.

Major Nonconformance.

The Supplier must respond to major nonconformances within 14 calendar days from receiving formal notification of the findings by MDOT.

Minor Nonconformance.

The Supplier must respond to minor nonconformances within 21 calendar days from receiving formal notification of the findings by MDOT.

- ✓ **Commentary:** Nonconformance is communicated in written audit reports. Seven days is the response time for a critical nonconformance. A critical item suggests that the nonconformance is serious enough that it will impact quality more immediately and jeopardize a product. Seven days is a long time in these cases. Production may be stopped more urgently if the issue is left unchecked and if continuing without correction would produce product that does not meet contract requirements. Extensions for resolution time will be granted on a case-by-case basis.

J. Special Audit

Suppliers may be subject to short notice special audits throughout fabrication until project acceptance. In the event a critical nonconformance, or two or more major nonconformances are observed by MDOT during execution of the contract, MDOT reserves the right to perform a short notice (no less than 24-hour notice) onsite special audit of the Supplier's QMS. Special audits may be scheduled to resolve critical and major nonconformances that are not adequately addressed by the Supplier.

A special audit may also be requested outside of a project scope when there is concern about the control of a process to maintain Supplier qualification.

K. Ongoing Assurance

The MDOT Program Manager may plan visits by an auditor at any time during project fabrication. The visits may be general surveillance in nature or may have specific target objectives to sample compliance.

L. Approved Supplier List

It is the Contractor's responsibility to use only qualified Suppliers on MDOT projects. Qualified Suppliers have satisfied the requirements of this program and are listed on the Approved Supplier List (ASL) according to their declared product category and approval status. The ASL can be found in MDOT's Structural Fabrication Quality Manual (SFQM). The SFQM will have a link to the ASL located on our webpage.

If a Contractor chooses to select a Supplier who is not on the ASL for products or services to be supplied, the products or services will not be accepted on the project.

Special arrangements may be granted in advance to expedite qualifying an unlisted Supplier before fabrication or the service begins. It is the Contractor's responsibility to obtain this consideration in advance and in writing from the MDOT Program Manager.

ASL Status and Restrictions

The approval status of the Supplier will assist Contractors in making selections for their upcoming projects. Details on initial status, maintaining approved status, restrictions, and terms of probation, disqualification, and dismissal are provided in later sub-sections. Depending on initial and continuing audit results, a Supplier's status may be indicated on the Approved Supplier List as:

"Approved" (Full Status): The Supplier can be selected for any work in the categories for which they are listed.

"Approved – Provisional" (Restricted Status): The Supplier can be selected for any work in the categories for which they are listed, but MDOT may restrict the number of project types and/or product quantities allowed to be produced at one time.

"Approved – Probation" (Restricted Status): The Supplier can be selected for any work in the categories for which they are listed, but MDOT may require additional third-party involvement. The level required will be indicated on the ASL as "Level I" or "Level II".

"Disqualified": Full requalification is required for re-entry into the program.

"Dismissed": A period of suspension from the program is required before full requalification and re-entry into the program.

"Hiatus": The Supplier voluntarily removes itself from the Program. The same restrictions as Unlisted apply. They are on the ASL but are not available for selection by a Contractor for a project.

Unlisted: The Supplier cannot be selected for MDOT work from bid time to project completion. They are not visible on the ASL.

Initial Status and Unlisted Suppliers

Before placement on the ASL, both the Supplier's QMS documentation and its QMS execution are successfully assessed for compliance to this program.

The Supplier remains unlisted until all document review and onsite audit nonconformances are addressed satisfactorily, and assuming there are no critical or major nonconformances.

Contractors may request expedited qualification of unlisted Suppliers prior to project commencement, based on MDOT resource availability and enough notice. After successful assessment per the

requirements of this program, MDOT would issue qualification documentation as evidence of approval until such time that the ASL is updated.

Maintaining Approved Status

Unrestricted approved status on the ASL for the categories audited continues by maintaining a functioning QMS, passing recurring MDOT audits without major or critical nonconformances and by producing work without serious product nonconformance. Minor audit nonconformances, if any, are resolved within the required timelines.

- ✓ **Commentary:** Serious product nonconformance is determined by MDOT on a case-by-case basis. At a minimum, impacts to critical path and public safety or structural integrity concerns are “serious” by nature.

Provisional Approval

Major audit nonconformance or repetitive minor product nonconformance may result in a provisional approval status.

As stated above, the Supplier may be restricted to a single project type, product category or limited product quantity for either a given project or for a given time period.

Probation

Supplier failure to address nonconformances in the time frames described in the Nonconformance Severity Chart or a significant number of major or critical nonconformances or serious repeat product nonconformance may result in probation and imposed third-party requirements.

At its discretion, MDOT may require Supplier QC Oversight (Level I Probation) or Third-Party QC (Level II Probation). Probation level will be indicated on the ASL and communicated to the Supplier in writing. Additional audits may be required to check compliance to the terms of probation.

- **Level I Probation– Supplier QC Oversight:** Supplier must retain and pay for an independent inspection and testing firm acceptable to MDOT to verify compliance to its QMS through oversight. The oversight firm must review all QC reports, material certifications, and be on-site to witness Supplier QC perform all functions stated in their QMS regardless of required frequency.
- **Level II Probation – Third-party QC:** Supplier must retain and pay for an independent inspection and testing firm acceptable to MDOT to execute the Supplier’s quality control program. The Supplier continues to execute their QC program and is responsible for the quality of the product.

Third-party QC will be responsible for developing project-compliant inspection and test plans as well as performing all required Supplier QC activities including producing required QC reports and documentation. Third Party QC will review the work and documentation produced by the Supplier QC operation. They also periodically observe the work of Supplier QC for improved technique and improvement. Significant discrepancies are resolved and may be reported to MDOT.

- ✓ **Commentary:** Suppliers achieving Approved-Full Status are not required to use third-party quality control.
- ✓ MDOT reserves the right to impose additional controls by the Supplier if MDOT is not satisfied the Supplier’s QC is capable of functioning without assistance. Note: MDOT QA activities are required as in the past.

Disqualification

Continued failure to comply with program requirements or continued non-response by the Supplier may result in disqualification from the program.

Re-entry into the program requires full requalification per the Reinstatement section below.

Dismissal

Gross disregard for program adherence or long-term unresponsiveness or serious product failures may result in the Supplier being dismissed from the program. Dismissal requires both full

requalification and a specified period of suspension from the program. Reapplication will require evidence of process improvement during the period of absence.

Reinstatement

From provisional approval: MDOT will determine requirements for removing provisional restrictions on a case-by-case basis. Decisions will be based on project performance and may include additional audits to check implementation or product mock-ups or other activities that demonstrate improved capability.

From probation: At its discretion and based on Supplier performance, MDOT will specify the duration of the probation period. Product mock-ups or other activities may be requested by the MDOT Program Manager to demonstrate improved capabilities prior to removing probationary status.

After disqualification: If disqualified from the program, the Supplier may contact the MDOT Program Manager in writing to reapply for listing on the ASL. In order to resume active ASL status, any outstanding CARs from previous audits prior to removal must be fully resolved before the reapplication process can begin. A new set of QMS documentation must be assessed and an onsite audit is required to be reinstated.

After dismissal: During the specified period of suspension, the Supplier must take serious steps to improve its quality management system. After serving the suspension, the Supplier must request reinstatement into the program in writing. The request must include documented evidence of process improvement and a commitment to MDOT program requirements. Reinstatement will require complete requalification including documentation review and onsite audit.

As determined by the MDOT Program Manager, circumstances may warrant further demonstrated performance before reinstatement from any status.

Hiatus

Contact the MDOT Program Manager in writing to voluntarily be removed from the Program and discontinue the periodic assessments required to maintain status. To resume active ASL status, any outstanding CARs from previous audits prior to removal must be fully resolved before the reapplication process can begin. Complete requalification including resubmittal of QMS documentation, and a successful onsite audit is required to be listed again.

If the Supplier left the program under disciplinary status (disqualification or dismissal), that status continues during this reapplication process. A Supplier should plan 6-9 months for reinstatement working through this status.

PROGRAM STANDARD

Required QMS Documentation

The requirements of this program are defined in this program standard. Each clause of the Program Standard 1 through 20 must be addressed by the supplier in their quality management system implemented and maintained.

1 Documenting Program QMS Requirements

The documentation organization or style does not need to reflect the titles or order of the HS SQS requirements in these clauses. However, a cross reference matrix against these elements is.

MDOT does not require the complete QMS documentation to be contained in single quality manual or document. If a combination of manuals, procedures, work instructions and forms is used, they must be referenced and connected in such a way that the user is easily guided to all requirements and how they related to other processes. MDOT specific procedures may be referenced from that manual or reside in separate documents at the Supplier's discretion

Documented procedures addressing each top-level clause of this program are required. It is not required that there is a separate procedure that addresses each clause. The Supplier may combine subjects and requirements in a way that best suits company culture and the firm's organization and processes.

Provide a cross reference matrix that shows where the system addresses the required program QMS requirements. This is necessary to assist MDOT in evaluating documentation and most importantly to assist the Supplier in self evaluating the contents of their documentation and their practices

The matrix is best accomplished using a table format listing each procedure or section number and a column for indicating the MDOT program clause number addressed. This is an excellent basis to conduct an internal audit of compliance with MDOT program requirements.

Procedures must contain:

- The purpose of the procedure - what will be accomplished or realized when this procedure is implemented.
- Process definition that includes steps required for completion
- Assignment of responsibility for performance
- Assignment of responsibility for review, revision, and/or approval of the procedure
- Identification of records that are generated
- For inspection procedure, the frequency of observations or inspections and how those observations or inspections are documented.

2 References

The scope of this program includes the applicable clauses and requirements of the current version (or contract version) of these documents:

- MDOT Standard Specifications for Construction (MDOT SSC) and Supplemental Specification for Errata
- MDOT Special Provisions and Supplemental Specifications
- 20SP-105A – Source of Steel and Iron (Buy America)
- 20SP-707A – Structural Steel and Aluminum Construction

- 20SP-716A – Coating of Galvanized Lighting, Signal, Sign, and Miscellaneous Support Structures
- 20SP-810B – Traffic Mast Arm Pole and Mast Arm
- 20SP-826J – Dynamic Message Sign Support Structure
- 20SP-826K – Small Dynamic Message Sign Support Structure
- MDOT Galvanizer Process Control Audit – Hot Dipped Galvanizing
- AWS D1.1 Structural Welding Code – Steel
- AWS A3.0 Terms and Definitions
- AWS A2.4 Welding Symbols
- RCSC Specification for Structural Joints Using High-Strength Bolts if HS bolting is used in the supplied structures.
- Other References, Special Provisions, or Supplemental Specifications that maybe implemented between revisions to this Supplier Qualification Standard

Other Recommended References (Dependent on category(s) the Supplier is qualified for)

- AWS D1.2 Structural Welding Code – Aluminum
- AASHTO/AWS D1.5 Bridge Welding Code

Including additional codes and standards called by the documents in this list.

Recommended References (Not Required as part of the SQS)

- AASHTO Specifications for Structural Supports for Highway Signs, Luminaires, and Traffic Signals
- ✓ Commentary: Clause numbering skips here to assist Suppliers who follow the AISC Certification Standard format as they audit their existing documentation against the MDOT HS SQS Standard requirements.

5 Management

5.1 Quality Policy Statement

The Supplier must craft a concise statement that is understandable and known by all key personnel. The statement must include how the company views their responsibility for quality and meeting customer project requirements. Describe how the quality policy is communicated to key personnel.

5.2 Performance Indicators

Establish performance indicators related to transportation project quality to continually demonstrate the effectiveness of the Supplier's Quality Management System. Oversee the creation of the plans to achieve them, and the current level of performance. Current level of performance must be tracked. Determine a target for each indicator to provide confidence that business is running well, and customers are receiving product in accordance with contract requirements. Have a method to evaluate these indicators by project.

Clearly describe the current achievement level and actions that are ongoing to address indicators that are not performing to a planned target. It is not required that the current Performance Indicators are described in the Quality Management System Documentation.

Develop, measure, review, and act on performance indicators to demonstrate control of the Quality Management System and a culture of customer responsiveness.

5.2.1 Product Quality

Product quality is a measure of producing the physical product as specified in contract documents.

Define critical, significant, and systemic nonconformances within the nonconformance tracking system. Correlate these nonconformances to the functional area of fabrication/manufacturing (burning, fitting, welding, drilling, assembly, coating, etc.)

Track product nonconformances. Review them monthly at the QC management level and at least every six months at the executive management level at a minimum. Establish a target level for frequency, recurrence, effects on critical schedule and cost where corrective actions are automatically invoked and management is notified immediately in critical situations.

Compare monthly rework and rejections by product type, deficiency, cause, shop or field discovery, time and cost for replacement or rework, and back charges by contractors. Examples could include rework hours for fillet weld or primer defects, undersized weld repair or paint mud cracking.

Consider correlating nonconformances by frequency, shift, process, consumable manufacturer, or other specific items.

Evaluate alternates of product redesign, process changes, type and timing of NDT, employee training and frequency of QC oversight. Enact changes and monitor their effect on product quality.

5.2.2 Schedule Status/Delivery

Create controls for the scheduling process. Include the methods early in the process to address threats to the schedule, actions to mitigate and how threats appear. Include damage controls and schedule recovery plans that are devised and implemented at an early point in the schedule when indicators of potential problems are noted. Require that effective counter measures are taken.

Develop an active scheduling process program that is readily accessible to key project management.

Track and measure project status in terms of days or hours behind or ahead of schedule against planned milestones. Evaluate the impact to customer schedule and focus on factors that are the major contributor to either positive or negative performance. Report to the customer missed milestones that impact customer schedule as soon as they are known, to foster a collaborative effort and project focus.

Milestones in this metric may include:

- Completion of contract review process prior to project kickoff
- Purchasing material and material receipt (example: Dates material Purchase Orders submitted, and dates material received and inventoried)
- Projected and actual dates for Shop drawing completion, review, submission, approval and release for production fabrication start against plan
- Projected and actual Production status milestones against plan (i.e. burning, fitting, welding, drilling, assembly, coating)
- Projected and actual dates for delivery dates to the field against plan

5.3 Quality System Awareness

Describe how the Supplier assures that personnel are aware of the QMS and their responsibilities to achieve objectives. Choose meetings, internal audits, written communication, or other effective methods. Show objective evidence to record how awareness was accomplished.

5.4 Organizational Chart

Provide an organizational chart, graphic, narrative, or other means to identify the key personnel showing reporting relationships. Assure that the top manager responsible for the facility is identified. Assure that the managers of the purchasing, design and detailing, manufacturing and quality process are identified, highlighting QCI and their reporting. Identify the Management Team on the organizational chart or other convenient method.

5.5 Facility Plan

Provide a facility plan showing the layout of the shop(s) and yard. Identify fabrication process equipment locations and material handling items such as overhead cranes. Additionally provide a list of key equipment utilized for fabrication.

5.6 Job Descriptions and Documented Evidence of Qualification

Include job descriptions and documented evidence of qualification for key personnel as identified in the Supplier Organizational Chart, including QCIs. Job description titles must match Org Chart titles.

Include responsibilities, authorities/decision making level and requirements for qualifications needed to hold the position in the job description for each key position or function. Personnel may be assigned more than one job function.

Documented evidence of qualification includes certification records, training history with supporting records, and a written record of work experience, preferably verifiable, which supports the responsibilities and authorities detailed in the job description.

5.7 Personnel Requirements

Specific titles and responsibilities are the duty of the Supplier. Titles used in the MDOT HS SQS are suggested and used for reference in this Standard, however these responsibilities are required and must be addressed in the Supplier's QMS.

5.8 Management Representative for Quality

Management must designate a position that is responsible for the maintenance and implementation of the QMS and the QC Plan that is part of the QMS. This position is a member of management but may perform other functions for the Supplier that do not conflict with these responsibilities.

Alternately, this responsibility can be handled by a Quality Committee with a designated member of management with the same responsibilities.

This position has the ability, responsibility, and authority to:

- Ensure that documented procedures needed for the quality management systems are established, implemented, and maintained in accordance with this Standard
- Reports to executive management, the management team or the Quality Committee on the performance of the quality management system and any need for improvement. This can be organized during the required management review
- Assure there is a system of awareness to ensure that all employees are aware of the quality policy and become a part of the QMS at their level of responsibility
- Assure that managers and employees are committed to the system and that awareness of customer requirements is communicated at their level of responsibility
- Communicate with customers on matters relating to the quality management system

5.9 QC Manager

The QC Manager may delegate tasks and select responsibilities to personnel under their supervision. They must have full authority and responsibility to take all actions necessary for the successful implementation of the QMS and its QC plan including but not limited to:

- Monitoring and utilizing QC inspections, and other QC practices to ensure that delivered materials meets specification requirements.
- Monitoring all materials prior to their use, to ensure their continued compatibility toward producing consistent quality.

- Periodically inspecting all equipment utilized in fabrication of the product(s) to ensure proper operation.
- Monitoring fabrication processes to ensure conformance with specification requirements.
- Maintaining and submitting all QC records and reports to the Engineer or the QAI.
- Directing the necessary corrective action to ensure continual conformance within specification limits.
- Monitoring welding program including welding procedure specification (WPS) approval, WPS revision, and welder continuity.
- Coordinating inspection with MDOT QAI.
- Participating in all pre-fabrication meetings outlined in MDOT SSC 707.03.B.2.

5.10 Personnel Qualification

The actual titles for personnel who perform these duties are the decision of the Supplier. Minimum requirements for qualification are listed here for these functions:

Function	Minimum qualification, certification, or skill level
QCI	Current AWS Certified Welding Inspector per AWS QC-1.
Welding Technician	Ability and extensive knowledge and experience in welding processes, procedures and equipment to develop, prepare, qualify, and execute procedure qualification tests, welding procedure specifications, and welder qualification.
NDT Technician	ASNT SNT TC-1A Level II
Detailing personnel	Able to demonstrate competency to prepare shop drawings in accordance with standard industry practice. familiarity with MDOT Standard plans and construction specifications. (see reference list)
Detailing Management	Ability and experience drawing and checking shop and erection drawings for highway structures. Ability to interpret provided designs and plans and guide in the preparation of shop and erection drawings. Able to train and evaluate detailing personnel and subcontractors
QC Manager	Must be in a position of authority to be able to affect change in QC issues in the company. Authority is reflected in the job description for this position and in the organizational chart.

Update MDOT within 48 hours when there are critical personnel changes during MDOT project work and before the start of each project by 10 business days.

5.11 Management Review

The Supplier must document the process used to conduct management reviews at planned intervals. The purpose of this review is to continually improve the suitability, adequacy and effectiveness of the plant's quality system. Reviews may be scheduled throughout the year that address all the items at once or only selected items. Subjects may be chosen based on nonconformances, customer focus or other significance to the Supplier. At a minimum, each item must be addressed and documented at least annually.

The management review must consider and record the discussions and actions taken related to each of the following:

- The status of actions from previous management reviews.
- Changes in external and internal issues effecting quality.
- Information on the performance and effectiveness of the quality system, including:

Extent to which the quality objectives have been met:

- Process performance and conformity of products and services
- Monitoring and measurement results
- Supplier performance
- External and internal audit results
- Corrective Actions taken from product and process nonconformities and audit findings
- Customer satisfaction and feedback

Resources:

- The adequacy of resources such as production equipment, structures and production areas, number of personnel, personnel certification, qualification, or training, measuring and test equipment.
- Opportunities for process improvement.

5.12 Quality Records

- Management review records
- Personnel certification and qualification records
- Job descriptions
- Documented evidence of qualification
- Facility plan

6 Contract Document and Specification Review

The first objective of a successful project quality management system is understanding the customer's project as defined by specifications, design drawings and general contract documents. The second objective is to translate the customer's project requirements to the Supplier's processes to deliver the project the customer expects. Describe how all applicable contract documents are thoroughly reviewed, documented, and communicated before a project is accepted.

6.1 Controlling Changes

Describe how changes to product requirements including design and development requirements are reviewed and changes are tracked to ensure full incorporation of the change into the processes affected.

Repeat the review process when contract requirements are revised by contract changes, clarifications from an RFI (request for information), a response to a Supplier proposal, or other official communication from the customer's authorized representative. The Supplier must include a process to communicate changes to responsible personnel.

Re-review is required only for areas affected by the changes which must be incorporated into the Supplier's project planning.

Address these specific documents/criteria:

- Contract documents (design drawings and specifications, special provisions and documented communications)
- Addendums, change orders and plan revisions
- Source of the change
- Documents and procedures affected
- Communicate changes to all applicable parties and data bases
- Transmittals from the owner or contractor
- Owner responses to RFI

Responses to Supplier proposals

- Delivery schedule, including incentive and disincentive clauses

Show how project specification review is conducted for each MDOT project. Design the review to identify and address critical project requirements that may impact project quality and schedule.

6.2 Notification to MDOT

Describe the plans for transmitting information and records (including purchasing data such as POs, MTRs and other documentation) to the Engineer or QAI (as appropriate).

Identify the personnel positions responsible for these records and creating timely transmittal targets.

Describe how the Supplier assures that the Engineer is provided with a list of subcontractors including fabricators, galvanizers and painters. Include addresses and a list of products they will provide.

Before work begins, determine the means of communication with the Engineer and Contractor representatives as part of the contract review. Record contact information for the Engineer and Contractor representatives and any specific communication requirements mandated by contract documents.

At or before the review, identify a project manager or other responsible position for all communication with the Engineer and QAI. Include provisions for attendance and active participation in the pre-fabrication meeting with the QAI and other MDOT representatives.

6.3 Specification Review Record

Show in a specification review record how MDOT project requirements were reviewed; decisions and actions must be documented. Consider requirements and how they might affect these areas.

- Request for Information and Proposals for deviation from contract requirements
- Purchasing
- Detailing
- Submittal and acceptance/review by contractor or owner
- Material identification and traceability
- Fabrication/manufacturing process
- Inspection
- Training and qualification

6.4 Quality records

- Change log (optional)
- RFI log
- Record of specification review

7 Detailing

7.1 Detailing Procedure

Develop, document and implement an effective procedure to control how fabrication details are created and how they communicate project requirements. Address how the review, generation, revision, approval, control and issue of shop drawings are accomplished and documented. Include responsibility for the management and functions of this clause, as well as the responsibility for specific tasks, including but not limited to:

- Ensuring that detailing procedures are followed

- Demonstrate the ability to understand MDOT Standard Designs for the product category(s) the Supplier products.
- Internal shop drawing review
- Preapproved drawing template by MDOT as part of the MDOT Shop Drawing Program and use prior to starting detailing
- MDOT approved welding procedures are incorporated into the shop drawing templates for submittal per MDOT SSC 707.03 A
- Proper application of welding symbols and approved welding procedures shown on the tail of the weld as required in MDOT SSC 707.03.A
- Proper application of the bill of materials for each piece mark
- Proper identification of NDT requirements
- Drawing submittals and owner responses
- Documentation of drawing changes
- How drawings are standardized
- How drawings are released to production and inspection and revisions are controlled

7.2 MDOT Shop Drawing Pre-approval

The Supplier detailing procedure must include participation this program. Participation establishes sample pre-approved shop drawings in accordance with MDOT standard designs. Participate in this program with a sample for each supply type that you provide for MDOT projects.

- Cantilever Sign Structures
- Overhead Truss Sign Structures
- Dynamic Message Sign Support Structures
- Traffic Signal Mast Arm Poles and Mast Arms
- Bridge Mounted Sign Connections (Aluminum and Steel).
- Tower Lighting Unit Structures

Why participate?

- ✓ Shop drawing approval is faster.
- ✓ The Supplier is more aware of specific MDOT requirements before bidding, and before detailing and fabrication/manufacturing begins.
- ✓ There is no need to update a detailing standard as MDOT design drawing do not often change.

7.3 Prefabrication Meeting

Develop, document, and implement an effective procedure for conducting prefabrication meetings (in accordance with MDOT SSC 707.03 B (2)) with MDOT, the QAI, and all responsible parties upon approval of the project shop drawings and prior to the commencement of fabrication for the project. Prefabrication meetings may be in-person or virtual depending on the level of inspection determined by MDOT's SFU.

7.4 Quality Records

- Design/Drawing Submittal Log (or similar)
- Design/Drawing Change Documentation
- Drawing Release for Production Log (or similar)
- RFIs, including responses

8 Quality Document Control

Develop, document and implement an effective procedure to control documents and data affecting the quality and conformance of the processes and products.

The document control system addresses the QMS Documentation, customer contracts and communications. The Quality Manual, Project Drawings, standard procedures and work instructions are examples of QMS documentation.

Describe how applicable Quality Documents and Quality Records are readily available to personnel who have responsibility in the QMS, either in hard copy or electronically.

Describe how each quality document is identified and maintained so that it is used properly by the right personnel.

Maintain a revision history page or other suitable method to identify changes to the QMS and approval dates for changes to the QMS.

8.1 Forms

Control blank forms with a revision date. Require that a management representative controls a master list of forms. Consider including on blank forms information that instructs the user how to complete the form or what information needs to be captured, entered, and analyzed.

8.2 Transmittals

Address how quality documents, submittals, records, and other project correspondence are controlled and distributed outside of the company using transmittal systems. Include how revisions are controlled with this system. Include methods for transmittal to owners, clients, subcontractors, and vendors.

Define how required documentation (copies of POs, MTRs, or other documentation required by the Engineer) is made available to the QAI in a timely manner so that inspection or review requirements do not impact project schedules.

8.3 Master List of Quality Documents

List all documents comprising the QMS by document name and revision date or level and assign responsibility for updating the list. Include the quality manual, any separate documented procedures and quality records identified in each procedure and section of the manual.

8.4 Contract Document Control/Log

Maintain a master log of contract drawings and specifications by project and assign responsibility for updating the log. Include document names and revision dates or levels. Use transmittals to track internal distribution of these documents and define distribution lists.

8.5 Fabrication Drawing Control

Maintain a master list/log or other effective method for tracking shop or erection/installation drawings produced by the Supplier by project and assign responsibility for updating the master list. Include approval process dates and record the dates issued to production. Use transmittals or other methods to track internal distribution and define distribution lists to ensure shop drawings are accessible to appropriate personnel during production.

8.6 Revision Control

Describe how revised documents in both electronic and paper media are managed, including how obsolete documents are managed, including methods to prevent inadvertent use.

8.7 Quality Records

- Transmittal
- Master List of Forms
- Master List of QMS Documents (may be combined with Master List of Forms)
- Contract Document Master List
- Fabrication Drawing Master List (may be combined with Contract Document Master List)

9 Quality Record Control

Define and document methods for the control of quality records. Provide for the following elements of control for quality records:

- Identification
- Collection
- Storage
- Maintenance
- Retrieval and backup of electronic data
- Retention
- Disposal

Retain project quality records for at least the project completion unless a longer duration is specified in the Supplier's QMS or contract. Retain other quality records that are not project specific as defined by the Supplier or as specifically noted in this Standard.

Ensure all quality records are legible and are stored in such a way that prevents damage, deterioration, or loss. Records may be electronic, hard copy, or a combination with appropriate controls described in the procedure.

10 Purchasing

Develop, document, and implement an effective procedure to define purchasing requirements. Ensure that all purchased products, materials, services, and subcontractors that have a direct impact on quality conform to project requirements.

Describe the internal controls regarding material ordering.

10.1 Purchasing Documents

Describe the effective use of purchasing documents that clearly describe subcontracted work purchased products, materials, and services. Purchasing documents may be POs, material requisitions, purchasing agreements, but they must be documents. They may support the requirements for verbal orders made later against the technical agreement in these documents. These documents are accepted by the vendor to apply to the technical requirements for the items and services they supply. The document must include at a minimum:

- Buy America requirements for steel products per MDOT Special Provision 20SP – 105A
- Material to be ordered by ASTM requirements to the applicable drawing, SSC section or special provision
- Quantity to meet contract requirements

- Date of delivery
- Delivery instructions
 - Requested Certificate of Compliance that must list the following:
 - Products are made and manufactured in the United States of America
 - Compliance with ASTM manufacturing requirements (MTRs)
 - Quantity not included in shipment communicated on shipping ticket/BOL (backorder info)

Documents for purchasing services such as detailing, nondestructive testing, liquid coating application, and hot dip galvanizing.

- Minimum personnel qualification/certification requirements that meet MDOT requirements
- Must have documented experience in steel and/or aluminum NDT inspection
- Must meet requirements of MDOT template program (for detailing)

10.2 Steel, Aluminum, and other metallic base metals

In addition to the purchasing document requirements required in 10.1, the following purchasing requirements are to be included in purchasing documents for steel, aluminum, and other metallic base metals.

- Ordering requirements for the specific ASTM requirements including grade, finish, or class
- ASTM requirements for acceptable mill or production tolerances
- Material traceability requirements including heat numbers or other special identification instructions
- Charpy V-Notch temperature zones for material requiring notch tough testing
- The Supplier's Quality Manual should address the responsibility for review, acceptance, storage, and submittal of MTRs to MDOT and/or the QAI responsible for the quality assurance inspection of the product

10.3 Welding Consumables

Purchasing documents for welding consumables, including filler metals, fluxes, and shielding gases should include the following:

Filler Metals

- Required AWS filler metal specification and classification for the approved welding procedure specifications
- Most recent manufacturer certification of conformance
- Manufacturer and trade name matching the approved welding procedures
- Packaging and delivery requirements
- Buy America requirements for welding of steel products
- Diffusible Hydrogen exposure testing designation as required for the project, code requirements or approved welding procedures

Fluxes

- Required AWS flux classification for the approved welding procedure specification
- Most recent manufacturer certificate of conformance
- Manufacturer and trade name matching the approved welding procedure
- Packaging and delivery instructions

Shielding Gases

- Type and ratio of the gas mix for the approved welding procedures
- Manufacturer trade name if specified on the approved welding procedure
- Most recent manufacture certificate of conformance
- Containers are marked to verify compliance with AWS A5.32

10.4 High Strength Fasteners and Anchor Rods

High strength fasteners (bolts, nuts, and washers) and anchor rod (also known as anchor bolt) assemblies (anchor rods, nuts, and washers) are to be purchased in accordance with MDOT contract requirements.

Purchasing documents for high strength fastener assemblies and anchor rod assemblies should include the following information:

- Buy America requirements for all assembly components
- High strength fastener and anchor rod assemblies are shipped in moisture proof containers
- Shipping containers (or associated documentation) are to be marked with the following information:
 - Verified Buy America provisions
 - Manufacturer and Supplier Name
 - Bolt, nut, and washer size, grade and lot number
 - Coating information
- Packing list from the supplier will require submission of the mill test report, manufacturer certified test report, distributor certified test report conducted by the manufacturer prior to shipping.
- Fastener assemblies, subject pre-installation should be provided from single production lots
- A signed certificate of conformance from the manufacturer indicating the fastener or anchor rod assemblies meet all MDOT Specification requirements.

Apply requirements specifically for anchor rods.

10.5 Purchasing of Galvanizing Services

Products that are to be galvanized after fabrication should have the following directions as part of the purchasing documents:

- Welds are to be blast cleaned prior to galvanizing
- Galvanizing operations are conducted per ASTM A123, A384, and A385
- Records of zinc coating thickness measurements are reported per ASTM A123
- Sampling for zinc coating thickness readings are based on the requirements of ASTM A123
- Notification to the galvanizer if the materials to be galvanized are reactive and the inclusion of the mill test reports for the material to be galvanized
- Notification to the galvanizer if the materials are to be duplex coated
- Descriptions and requirements for any visual requirements for aesthetic products
- Acceptable repair procedures
- Products to be galvanized are identified using metal tags or other methods acceptable to MDOT
- Additional venting and drainage holes are not permitted without approval of the Supplier
- Request for a certificate of conformance from the vendor stating the galvanizing supplied meets MDOT contract requirements
- Qualification in accordance with MDOT Galvanizer Process Control Audit – Hot Dipped Galvanizing

Define the process for coordination with the galvanizer when project Special Provisions require a MDOT supplier qualification process audit of the galvanizing facility prior to commencement of the work. Note: Reference the MDOT Galvanizer Process Control Audit – Hot Dipped Galvanizing

10.6 Purchasing of Coatings

Assure that the purchasing documents clearly identify the product or system and request a certificate of conformance with the paint name and a statement from the manufacturer indicating that the test performed meets or exceeds the coating specification.

Ensure the purchasing document requests a certificate of compliance/conformance/analysis for all product material from the manufacturer as well as the manufacturer's product data sheets for all product components. Request this quality record for each specific batch of thinner, catalyst/activator, and primer. Ensure the certificate manufacturer certifies that each batch has met the manufacturer's testing requirements and applicable ASTM requirements and the certificate has these items as a minimum:

- Manufacturer name
- Product name and ID number
- Batch number
- Date of manufacture (may be on product)

Containers must clearly identify their contents with these details at a minimum:

- Color (federal standard number, or manufacturer's number) if applicable
- Lot/batch number
- ID/stock number
- Container quantity
- Date of manufacture and shelf life (If expiration dates are obscure, the Supplier should prominently add the dates)
- Manufacturer's name and address
- Storage condition limitations
- MDOT approval information.

10.7 Subcontracted Coating Services

Purchasing documents for subcontracted coating services should communicate the following information:

- MDOT contract requirements
- Coating system to be applied
- Required surface preparation for coating application to bare steel or duplex coating over galvanizing
- Subcontracted coating applicator to provide records of surface preparation and coating thickness measurements
- Required hold points for verification inspection by MDOT QAI

Records of coating information including:

- Coating color
- Lot Number/Batch Number
- ID/Stock number
- Coating Manufacturer
- Date of manufacture, shelf life, and expiration date.
- MDOT approval information, if applicable
- Records of coating mixing information and environmental conditions
- Certificate of conformance for the coating product
- Certificate of conformance from the vendor stating coatings and coating operations meet MDOT contract requirements

10.8 Evaluating Vendors

Describe the methods used and responsibilities to evaluate and approve new vendors and subcontractors before they are permitted to furnish any product or service. Evaluate new vendors

based on an on-site visit, references, reputation, facilities and equipment, work samples, or possessing the necessary certifications and capabilities for supplying goods or services. Capture and maintain a list or database of qualified vendors that become your Approved Vendor List (AVL). Describe methods for how the vendor ranking or approval status on the AVL is determined and scheduled for periodic review.

Evaluate all vendors and subcontractors at least annually and more frequently if job conditions change or products and services are questionable.

Consider:

Quality of the finished products; [may include adherence to specifications/drawings/quality requirements; Accuracy of product in size, marking, condition and appearance.

Accuracy of support documents (test reports, certificates of compliance, etc.)

Delivery of products in accordance with schedules (on time) and in a proper manner (protected, arriving with proper certs, in required condition, from MDOT approved vendors when required, and other requirements as specified in the PO.)

Records Include:

- POs, purchase agreements or other document that defines the requirements of the product or service purchased. These are written contracts with a stated technical standard for the material, product, or service to be purchased.
- Approval record and any applicable documentation that goes with the agreements.
- Qualification records, such as supplier certificates, personnel certificates, etc. for each requirement per the Supplier's certification
- Records of any necessary actions based on the Supplier's evaluations of vendors.

10.9 Purchasing Quality Records

- POs
- Subcontractor waiver from customer
- AVL or similar listing and a record of review
- Supplier and vendor qualifications and evaluations.
- Current certification records of subcontractors

11 Identification and Traceability

Develop, document, and implement an effective procedure for the identification and traceability of materials, fabricated sub-products and final products. The procedure describes how the Supplier assures appropriate identification by specifying at the purchasing process and assuring and applying at the receiving process. The procedure also describes how the identification is marked or maintained from the point of receipt to the point of incorporation and then delivery to the project. The process must assure incorporation of the correct materials into the product and enable MDOT to trace the materials to the product at the levels specified.

11.1 Product ID

Inspection at receiving is a critical part of providing traceability, particularly documenting receipt of materials and review and filing of vendor-supplied documentation. ~~Evaluate vendors on the completeness and accuracy of the documentation they supply with their materials, products and services. Include in that evaluation how received items are marked.~~

For finished product, document how each finished highway structure is uniquely marked to confirm production and to link the product to the specific conformance. testing by the Quality Control Department and to raw materials or assemblies used in its manufacture.

Describe how the product identification will link to a production schedule and to in-plant quality control records. Describe how the mark number also links the product to the erection plan. These mark numbers and dates can be marked on the product or by other approved methods including:

- Product ID tags
- Stamping
- Match marking for pieces to be assembled in the field

11.2 Material ID

For metallic materials such steel and aluminum plates and shapes, the Supplier must create an effective system to document the receipt and identification of material. The Supplier's method of identification of material must maintain the required identification for the base metal (type/shape, grade, and heat number) from receipt through the first fabrication operation.

11.3 Material Traceability

Describe how material maintains identification throughout the entire fabrication process. Maintaining traceability may be achieved through the following:

- Heat number and piece mark are marked and maintained throughout the fabrication process after the first fabrication process commences.
- Material assignment documents (such as cut lists) which record the identification of the material to the associated piece mark
- Other methods acceptable to MDOT and the QAI.

The Supplier 's procedure will describe the method of maintaining the identification of drops and remnants of material if the material will be used on future MDOT ancillary highway products.

11.4 Mill test Reports (MTRs)

MTRs should arrive with or before the receipt of the material. Personnel will verify upon receipt that the MTRs match any heat number markings on the material from the vendor or the mill that produced the material. The MTRs must be compared with the purchasing and receiving documents as part of the receipt inspection to verify the material meets MDOT requirements for the specified ancillary product to be fabricated.

11.5 Bolt (high strength fastener assembly) ID

Fasteners are to be received and stored in containers that clearly identify the fastener components by type, grade, size, and lot number(s) lot number when applicable for the product. The containers must also indicate the test status on the fastener assemblies or components indicating that pre-installation verification testing has been performed for shop installed bolts. Certificates of conformance for the fastener assembly components (bolt, nut, and washer) and MTRs that traceable to the lot numbers on the storage containers, pre-installation verification test records are to be maintained upon receipt.

11.6 Welding Consumable ID

Identify welding consumables at receipt that the consumables are in accordance with the appropriate ANSI/AWS A5.X specification and classification specified in the purchasing documents. Identify flux

and electrode oven contents prior to adding new consumables to the storage ovens. Do not use welding consumables without correct, verified identification. Labels on shielding gas bottles must verify compliance with AWS A5.32. Assure that certificates of conformance for welding consumables are current and show diffusible hydrogen content.

11.7 Uncontrolled Material ID

Materials and consumables that have lost identification or were not purchased in accordance with MDOT specifications are to be marked using appropriate methods identified in the Supplier's Quality Manual. The procedure should effectively prevent any uncontrolled material from being incorporated into any MDOT projects.

Should the Supplier have the need to use uncontrolled material, Supplier's Quality Manual should address the procedures for requesting, performing testing, and documenting the identification of the material that is acceptable to MDOT.

11.8 Fabricated Metal—Subcontracted Supplier

Steel or Aluminum must be supplied per the ASTM Standard specified on approved shop drawings. Material test reports (MTR) must be provided traceable by heat number and be able to demonstrate Buy America status. Raw materials must be identified at receipt and maintain identification until the first fabrication operation. There must be an effective method to later connect the MTRs with the shipment to MDOT.

Identify the Welding Procedure Specification (WPS) and welders used for the project. Include WPSs and Welder Qualification Test Records (WQTR(s)) with the submittal.

Through POs or purchase agreements, the Supplier requires that the vendor identify finished pieces (part number, PO number or other suitable marking or tagging) so that MTRs can be assigned appropriately to the submittal package. Require current welding procedures and qualified welders to perform the work per *AWS D1.1 Structural Welding Code—Steel* or AASHTO for structural steel shapes and per *AWS D1.2 Structural Welding Code—Aluminum* for welded aluminum products.

It is required to use an MDOT shop that is participating in the quality program requirements program. Using a qualified shop also does not relieve the Supplier of the need to qualify the vendor. The selected vendor must transmit current WQTR(s), WPSs and MTRs that support the delivered work.

11.9 Materials supplied by others

Establish a method for identifying and controlling materials received from the Supplier's direct customer or contractor intended for inclusion in the fabricated product. Address both materials ordered to specification and materials not ordered to specification; define documentation and identification requirements for both situations. Include provisions for ensuring the materials are correct such as written details/instructions from the customer, including MDOT acknowledgement where applicable.

11.10 Quality Records

- Vendor Delivery Tickets, purchasing documents
- MTRs, Manufacturer Test Reports, Distributor Test Reports
- Certificates of Conformance
- Subcontracted fabrication inspection reports
- Traceability records

12 Fabrication/Manufacturing Process Control

Develop, document, implement and maintain effective procedures for fabrication processes that control the quality of the finished product.

12.1 MDOT pre-approved standard procedures for fabrication

Plan for fabrication procedure reviews. Production can continue with less delay if this is considered in advance. Procedures requiring Engineer approval prior to performing are:

- Straightening and repair of damaged material (707.03.D.6),
- Weld splatter removal procedure prior to blasting/coating (707.03.D.10.b)
- NDT procedures if required for product manufactured (707.03.D.11 and D.12)
- Written weld repair procedures (20SP-707A-01.c. 5.25)
- Correcting errors or defects in fabricated material (707.03.D.19)

12.2 Notification and submittals before work begins

Establish a procedure that provides advance notification (14 days minimum) as required by the MDOT *Standard Specifications for Construction*, including Inspection Test Plans (ITPs) to MDOT to plan for verification inspections throughout fabrication. Notification procedures should include the plan for scheduling pre-fabrication meetings with MDOT and the assigned QAI.

12.3 Base Metal Repairs and Temporary Attachments

Define the criteria and procedures for base metal repairs. The methodology for developing the repairs should be based on ASTM A6 and AWS D1.X welding code for the material and governing code furnished.

Base metal repair procedures may be submitted to the MDOT SFU for approval for use prior to fabrication. Include in the procedure how MDOT SFU approved repair procedures are maintained and distributed for production personnel and the MDOT QAI for proper usage during repair operations.

Address connection and removal of temporary attachments and their inclusion on the approved shop drawings.

12.4 Welding Process Control

Procedures for welding will address the following:

12.4.1 Welding Procedure Specifications (WPS)

Describe the method of establishing, qualifying, and obtaining approval of WPSs.

Describe how WPSs are developed for each fabricated product based on the governing AWS D1.X welding code, revised in accordance with MDOT 20SP-707A-01, controlled, submitted to the MDOT SFU for approval, and assigned for production work.

Include in the procedure how the WPSs are maintained and made available to the welders. Define how the welders are trained on interpreting and can demonstrate how they use the information in the WPS and determine which MDOT SFU approved WPS is to be used for tacking and production welding. MDOT specifically requires MDOT SFU approved WPSs to be located at each welding station. Include how other appropriate personnel have accessibility to WPSs.

Welders and/or supervisors must demonstrate how they assure compliance to the MDOT SFU approved WPS they are using and how compliance is periodically monitored.

Note: During an audit, the welder may be asked to describe and demonstrate how the base material, filler metal, electrical characteristics, preheat and other requirements of the WPS are executed and maintained.

12.4.2 WPS (Prequalified Welding Procedure Specifications)

Develop prequalified WPSs for each process, joint, and position required, meeting the requirements of the appropriate AWS D1.X as it relates to an ancillary structure product to be supplied. Define the responsibility for development.

12.4.3 WPS (Qualified Welding Procedure Specifications) and PQR (Procedure Qualification Records) – D1.5 and D1.2

Develop and perform a weld procedure qualification test based on the need for Welding Procedure Specifications (WPSs), resulting in a Procedure Qualification Record (PQR) used as a basis for those WPSs. Define the responsibility for the development of the PQR and subsequent WPS. Procedures for qualification of PQRs should include the requirement for notification to MDOT SFU for scheduling the MDOT QAI for observation of procedure testing

12.4.4 Welder Qualification

Describe the controls to qualify (test) all welders and weld operators in accordance with the provisions of AWS D1.X for the process, position, and material required for the work before the welder begins work. Welders must be qualified per MDOT SSC Section 707 and the MDOT *Welder Qualification Program* and witnessed by an MDOT QAI. Describe the controls to prevent welders qualified by other agencies from welding on MDOT work.

12.4.5 Welder Qualification Maintenance

Describe the process that demonstrates and records the continuity for welder's period of effectiveness and retesting as required in MDOT SSC Section 707 and the MDOT *Welder Qualification Program*. Accurately document the welder's use of each qualified process, maintaining the continuity from the date of the original coupon welding test with breaks in the record no greater than six months.

Ensure that the record (log, roster, or other suitable document) is available to production supervision and the MDOT QAI if there is a need to check the continuity. Additionally, ensure that a current copy of MDOT Form 0396 – *Welder Qualification Test Report* is available for verification of all welders working on MDOT projects.

12.4.6 Welding Consumables

Describe in a procedure how consumables used in each operation meet the requirements of the WPS per the AWS A5.X specification on the WPS. This includes how they are stored, marked, and distributed to production. Identify the specific responsibilities for control.

Describe low hydrogen procedures for the SMAW, FCAW and SAW processes. Assure that the low hydrogen procedure addresses these elements:

- Packaging requirements specified by purchasing function
- Initial storage at receipt inspection
- Exposure limits, methods to record limits appropriate for the consumable

- Process for baking and re-baking
- Maintenance of flux and consumable integrity including flux recovery and recycling
- Cleanliness and handling during the welding process and between welding sessions

12.4.7 Welding Activity Identification

Identify the activities performed by Production and QC before, during and after welding that will be integral to the development and use of the ITP. Suggested items include but are not limited to:

- Verification of welder qualification
- Verification of approved MDOT WPSs
- Joint fit-up and cleanliness
- Fixture, clamping, and pre-cambering arrangement adequacy
- Preheat temperature
- Use of Approved WPs
- Use of corrected electrodes, fluxes, and gases
- Root pass inspection
- Interpass cleaning and temperature control
- Visual weld size and length inspection as part of in-process and final acceptance
- Welder identification of splices
- Completed weld cleanliness
- Post weld NDT
- Weld repair recording and notification to QAI

12.4.8 Welding Equipment

Assure that power sources, wire and flux delivery systems and other equipment consistently deliver parameters to meet the requirements of approved welding procedures.

Describe in a procedure how the Supplier verifies the output of welding machines with a calibrated Amp/Voltmeter. The procedure should address:

- Frequency of machine verification based on requirements of the applicable code
- Acceptance criteria for voltage and amperage
- Actions taken if welding machines are found outside the acceptance criteria
- Personnel responsible for verifying and generating verification records generated

12.5 Quality Records

- Welding Procedure Specification
- Procedure Qualification Record
- Mill test reports
- Welding Consumable Certificates of Conformance
- MDOT Form 0396 – Welder Qualification Test Report
- Welder continuity records
- Weld machine verification
- Annual volt/amp meter Calibration Record

12.6 Bolting Process Control

Assure that the storage, pre-installation verification, installation, and inspection of high strength fastener assemblies are in accordance with the project specification and the current edition of RCSC *Specification for Structural Joints Using High Strength Bolts*. Anchor rod assemblies are to be stored in accordance with the current edition of the RCSC specification and the project specifications.

Be prepared to demonstrate pre-installation verification.

It is not required to address shipping bolts, which are bolts installed for temporary use, or fasteners, other than high strength.

A Bolting Assembly is one bolt, washer(s), and one nut of the same diameter and grade selected and tested to install together constitute a “bolting assembly” (BA).

12.6.1 Receiving and Storage

Describe how all structural bolting assemblies are received in sealed containers until used or shipped to the project site. Containers are kept in a clean, dry location out of weather to protect from dirt and corrosion. Require certificates of conformance and documentation for required manufacturer testing with all shipments and their review by a qualified position and submittal to the MDOT QAI for verification. Describe the process for the sampling of high strength bolts, anchor rods, bolts, and washers per the MDOT Material Source Guide including segregation, identification, control of tested and untested lots, witnessing and submittal to MDOT for acceptance testing.

Inspect the containers and check the container marking to assure the bolt/washer/nut type, lot and size designation is correct and legible on the side of the container or other means that will ensure traceability. Define how fastener assembly components are removed and returned to storage when fasteners are shop installed.

12.6.2 Preinstallation Verification

Provide a step-by-step instruction for performing this test in accordance with *RCSC Specification for Structural Joints Using High Strength Bolts* and MDOT specifications when required for shop installed fastener assemblies

Assure that this test is performed by the crew that will perform the shop installation.

Perform this test on bolt/nut/washer combinations that will be installed in pre-tensioned joints. It is not required to perform this test on bolt/nut/washer combinations that will be installed in joints that are designated as “snug tight” condition only.

If the diameter, grade, or lot of one or more of the components of the assembly changes; the new combination is a new fastener assembly. Describe what is done when a new combination must be tested and recorded as a unique fastener assembly.

Describe how the results of the pre-installation verification are recorded and how containers of tested combinations are identified. Make the record available to installation crews and inspectors to check which lots have been tested together and can be used in production. Make these records available for the contractor and the QAI.

12.6.3 Shop Installation

Address how these issues are evaluated and communicated to production and inspection activities when shop bolting is required:

- Requirements for how bolt holes are prepared by punching or drilling and the acceptable tolerance for proper installation.
- Faying surface cleanliness
- Procedures for drawing and returning fastener assemblies from tested and accepted lots
- Tightening procedures
- Snug tight is the first tightening procedure
- Turn of the nut procedures for final tightening of the fastener assembly

12.7 Quality Records

- Bolt Records
- Preinstallation Verification Test Record
- Certificates of Conformance (for all fastener and anchor rod components)
- Calibration Certificate of Conformance for bolt tension calibration device

12.8 Preparation for Coatings

Describe in a procedure how the Supplier assures fabricated products prepared to receive coatings after fabrication. This includes cleaning of base and weld metal to receive hot-dip galvanizing.

12.9 Distortion Control

Establish a procedure that provides for the control of distortion from welding processes to ensure the proper contact and bolting of the products being supplied. Items to be addressed as part of the distortion control plan include as a minimum:

- Weld planning and sequencing
- Joint alignment during fitting and tacking
- Fixturing
- Heat correction

12.10 Additional Shop Fabrication Processes

Establish written procedures to assure that shop fabrication process used will provide products that meet MDOT specifications. If used in the fabrication of the product category, include these processes as a minimum:

- Drilling/Punching
- Rolling
- Bending
- Cambering
- Straightening

13 Inspection

13.1 ITP

The Supplier must develop and follow an inspection and test plan or ITP to ensure all criteria defined in the scope of the project are satisfied.

See Figure 2 in the document annex for a sample of this mandatory requirement. The sample is comprehensive. A Supplier's ITP may be less comprehensive and have more or less specific project related requirements.

13.1.1 Planning Inspections and Tests

Required inspection hold points for either QCI or QAI may be based upon the Supplier's typical procedures or established specifically for MDOT projects. Information is also gained in communicating with MDOT on project specific interests. Additional points may be necessary depending on project complexity.

Submittal of the ITP is not required, but the Supplier is responsible for reviewing and updating it based on the requirements for each project. Refer to the MDOT Highway Products Fabrication ITP Sample in the Annex of this Standard for assistance in development. This sample format and content is non-mandatory. The Supplier must develop a suitable format and content to meet specific project requirements and to function appropriately in their company. Discussion of hold points may occur during prefabrication or preconstruction meetings when required by contract.

13.1.2 The ITP as a record

The ITP provides a basis to communicate and record:

- The inspection points and characteristics inspected (as detailed in the in-process inspection procedure)
- The frequency required for the inspections
- Supplier personnel responsible
- Process control limits (QC Action Limits)
- Acceptance criteria (QC Suspension Limits)
- Hold points where either the QAI or QCI documents acceptance prior to subsequent processing steps

13.2 Coordination with the MDOT QAI

Establish a method for communicating with the MDOT QAI (Quality Assurance Inspector). It is essential that both Supplier and MDOT QAIs coordinate hold points such as witnessing production or quality control activities, verifying documentation, performing verification inspections, or other activities that could impact schedule.

Address the responsibility to directly communicate production and quality control schedules and updates so that MDOT QAI can honor both their QA obligations and the schedule as much as practical. Highway structures fabrication inspection may not require full time onsite inspection by the MDOT QAI. Coordination with the MDOT QAI is important to determine inspection requirements for each project.

MDOT QAIs must be notified of all production and quality control activities; they may consent to the Supplier proceeding without their presence or may request to be present for more than the minimum required number of hold points. Last minute changes should be avoided.

Include provisions for documenting requests for inspections or notifications of specific activities requiring MDOT presence. Ensure the method requires written acknowledgement by the QAI and captures any waived hold points or requests to be present for additional activities beyond the ITP.

13.3 Non-destructive Testing (NDT)

Describe how non-destructive testing written practices are developed for each method of testing based on the governing ASNT and AWS D1.X welding code requirements for testing methods, personnel qualifications, test reporting.

Include in the procedure how the written practices are maintained by the Supplier's certified personnel or through the use of third-party testing agencies and NDT procedures which are submitted to the MDOT SFU for approval prior to testing of welds.

13.4 Inspection and Test Status

The procedure must address how the Supplier marks or identifies the inspection status of in-process and completed product. The method must be consistent and understood among inspection personnel and the status must be clear to production personnel. The method may be markings or tags on the

product or materials, records (accessible hard copy or electronic) that record the current status or a combination. Marking or recording must be updated as soon as possible to protect the process. Status milestones include conditions met or pending such as received, dimensional, activities prior to, during and post welding by production and QC inspection personnel, notification to the MDOT QAI that repairs are ready for verification or under evaluation from the owner for resolution of a nonconformance.

13.5 Inspections to be Completed

13.5.1 Receipt Inspection/Acceptance Testing

Describe how materials or assemblies are received and verified to conform with the technical requirements of the POs or purchase agreement standards. Those requirements may be referenced by a standard record form or other methods.

Describe the method of acceptance of all materials prior to use or shipment including base metals, welding consumables, high strength bolt and anchor rod assemblies, and coatings. Certificates are not always available for all materials; describe alternate testing to be performed for each material.

13.5.2 In-Process Inspection

Document a procedure that identifies the in-process inspections necessary to ensure product quality. The procedure may reference the ITP for specifics. At a minimum, define the characteristics inspected, frequency or sampling plan, and the means of recording acceptance for the following inspections:

- Material Preparation and Fit-up – indicate production or QC activities performed during cutting and fitting of material prior to welding
- Welding fabrication inspection – indicate production or QC activities performed before, during and after welding operations meeting the requirements of the project requirements or applicable AWS D1.X welding code.
- Non-destructive Testing – indicate inspection requirements and frequencies, and certifications for the non-destructive testing requirements specified in the contract documents.
- Inspection of repaired welds – indicate requirements for reporting and inspecting identified weld repairs
- Inspection of coatings and galvanizing – indicate inspection requirements for receipt of galvanized product and coatings over galvanized product

13.5.3 Final Inspection

All products must be inspected prior to shipment. The inspection procedure must define the characteristics to be inspected, acceptance criteria, when the inspection must be performed, the qualification requirements of the final inspector and how the final inspection status of each product will be identified and documented; it may reference the ITP for specifics. Tolerance for dimensional control is either defined in the project requirements, shop drawings, or the specified AWS D1.X welding or ASTM code.

The procedure must describe measurement methods and instrument/equipment precision.

Assure that vent/drain holes, lifting devices, or other alteration is shown on the approved shop drawings and meet code and specification requirements. Alterations made that are not shown on the shop drawings may need further permission from MDOT if not pre-approved.

13.6 Inspection (QC) Records

Describe the process to maintain complete records of all QC tests and inspections. Include enough information to allow the observation or test results to be correlated with the items of work represented. Document what action was taken to correct deficiencies. Furnish one copy of all QC records, including non-destructive testing, to the MDOT QAI within 24 hours after the date covered by the record in a format acceptable to the Engineer. The Engineer may withhold acceptance of the products for failure to provide properly documented and timely QC records and reports

13.7 Quality Records

- ITP
- Fabrication Inspection Records in process and final inspection (dimensional, fit-up, welding, welding repairs, shop applied coatings)
- Non-destructive Testing Inspection Record
- Sub-contracted Coating and Galvanizing Inspection Record

14 Calibration and Maintenance of Inspection, Measuring and Test Equipment

Develop, document and implement an effective procedure to control, calibrate, verify, and maintain inspection, measuring and test equipment used to demonstrate that products and processes comply with specified requirements.

At a minimum, these gages must be included in the program:

- Welding Machines
- Tape Measures
- Bolt tension calibrator
- Weld inspection gages
- Amp/Voltmeter
- NDT equipment as the category requires

14.1 Equipment Listing and Identification

Identify the gages and equipment measuring devices that are used to demonstrate the conformance of product, or gages which provide direct process measurements that determine product compliance.

Create an equipment list that provides a means for unique identification of each piece of equipment. Each piece of equipment will bear a unique identification "mark", serial number or a precise description that ties the equipment specifically to the list and the calibration log. Calibration for each device may vary depending on manufacturer's requirements and use in the plant.

Calibration/verification frequency is determined by manufacturer requirements, code requirements, and Supplier's established procedures. Specify the accuracy required.

Sample:

Note: this is an incomplete list of inspection tools that may require calibration. The verification frequency should be determined based on the precision required to meet inspection accuracy.

Tool	Calibration/Verification Frequency	Accuracy Required	Source
Amp/Voltmeter	Annual	Mfr. Recommendation	External
Master Tape Measure	10 Years or damage	Lab or Mfr. Certification	External
QC Tape Measure	3-month verification	± 1/32" per 25'	Internal
QC Fillet Weld Gage	Annual verification	± 1/32"	Internal
Weld Machine Meters	3 month – 1 year verification	± 5% of meter	Internal/External

14.2 Calibration Procedures

Develop a calibration work instruction or procedure that identifies the plan testing parameters, calibration/verification frequency, and the accuracy required. If the calibration is done internally by Supplier personnel, or by an external source, document the actions to be taken when equipment or gage does not meet the calibration/verification requirements. List the actions taken when un-calibrated or inaccurate inspection equipment was used for inspection activities.

Include assessment points throughout the full range of the inspection equipment such as pre-defined measurements on a tape measure, fractional sizes of fillet gages or amp and volt ranges corresponding to required parameters on WPSs.

14.3 Internal Calibration Procedures.

Describe the qualifications required for internal personnel to perform the work and that calibration equipment or master gages needed to perform the work are traceable to a national standard. Describe any stamp or license necessary to be qualified to perform calibration testing.

Identify master gages in a log or list. A master gage is a gage that is purchased and traceable to a national standard, typically from a gage supplier who also supplies documentation (certification of conformance) certifying traceability. Choose what master gages are necessary to calibrate gages used in the scope of supply and demonstrate traceability to a national standard. Define processes used to prevent master gages from being used for activities other than calibration/verification to maintain accuracy.

14.4 External Calibration Services

Assure that external sources are qualified by the Purchasing function or other designated professional. Identify the laboratory, agency or certification required by that source to perform the work. Obtain the agency's testing procedure that identifies any testing standards (AASHTO or ASTM) that must apply to the operation. A testing certificate or report may be all that is needed to identify the test parameters and equipment used for calibration/verification is traceable to a national standard.

14.5 Calibration Log or Calibration Records

Detail the responsibility for maintaining records and identification on gages. Show in a calibration log or other suitable record:

- Gage (description)
- Gage identification
- Specific frequency of calibration
- Accuracy required
- Measurements to be taken
- Actual measurements
- Standard used for calibration
- Date of calibration
- Next due date

14.6 Quality Records

- Calibration certificates of conformance
- Calibration Log/Record
- Personnel qualification licenses or documents

15 Control of Nonconformance

Develop and document an effective procedure for recording and controlling both product and process nonconformances.

15.1 Nonconforming Processes

Process nonconformances are deficiencies in methods reflected by recurring errors and negative trends in the performance of the QMS. These can be process or system nonconformances in support processes (like detailing, contract review, purchasing, generation of CAD data) and operational functions (like CAD directed equipment, faulty consumables, uncalibrated equipment, poor electrical connections, or consistent human error due to lack of training).

15.2 Nonconforming product

Product nonconformances are deficiencies in products or materials that do not conform to contract plans, shop drawings, NDT procedures, customer intended use requirements, applicable code requirements, or company requirements.

15.3 Nonconformance Log and Tracking

Describe how nonconformances are identified, recorded, and tracked. Define a method that is easy to note both positive and negative trends. Submit MDOT nonconformances to the State on Form 0559

15.4 What to Record

Record and track nonconformances in reports and/or one or more logs of a desired format.

Define what will be recorded, but include the following as a minimum:

- The pieces affected,
- the nature of the nonconformance,
- disposition of affected items still at the Supplier or already shipped, and
- potential ramifications for similar items on previous projects.

If product is found to be nonconforming, establish a procedure for evaluation by qualified personnel to determine one of the following dispositions:

- Repair
- Rework
- Scrap
- Use as is

When the proposed disposition is determined to be used as is, describe the process for documenting deficiencies and submitting to the MDOT QAI for review or approval before any further processing occurs.

15.5 Recording Re-inspection

When nonconforming product is repaired or reworked, it is subject to the original inspection criteria; record the results, including the inspector who made the re-inspection and date of acceptance. Link the new record to the original deficiency record if they are separate documents in your system

Include other pertinent information to periodically track and analyze nonconformance trends and recurrence rates.

15.6 When to Record

Clearly define the threshold for recording a nonconformance. For product nonconformances, consider basing it on structural severity, costs, time to correct, or other criteria appropriate to your organization. Process nonconformances may have similar criteria and may be based on significance. However, they are often recorded even if only one occurrence is found. A single nonconformance in a QMS process typically indicates only the tip of the iceberg. Waiting for more of the same process nonconformances may expose the process to many more multiple errors.

15.7 Significance

A nonconformance can be considered significant if it is associated with a defect that jeopardizes the safety, functionality, ease of erection/installation, delivery and/or serviceability of the structure. This may include improper material, numerous or repetitive nonconformances, significant dimensional errors, deficient weld properties, or incorrect joints and connections.

15.8 Quality Records

- Nonconformance Report or Log (Supplier Form)
- Nonconformance Report (MDOT Form)
- Repair inspection records
- Management review of nonconformances (Management Review record)

16 Corrective Action

16.1 General

Not every nonconformance is considered for corrective action. Identify the responsibility in the organization that evaluates the issue and decides if a CAR will be issued. Issue CARs by looking at summaries of product nonconformances, the results of QMS audits or noted as a regular course of business.

Describe the methods and responsibility to close CARs after evaluating the root cause and implementing the actions developed to prevent recurrence. After the selected actions are taken, verify the deficiency has been corrected to close the CAR. Schedule a re-audit of the situation after an appropriate interval to assure continued effective implementation.

16.2 Causes for Corrective Actions

- Significant nonconformances
- Product or process nonconformances are repetitive
- Nonconformances identified from internal or external audit
- Undesirable conditions affecting productivity, delivery, employee safety, customer relations, or other Supplier goals.
- Requests or complaints from an external source
- When performance indicator targets are not met

Invoke the corrective action system when nonconformances are identified during external audits by a customer or agency. The external source may require a response using their own formats, deadlines, and requirements; the Supplier must enter the issue into the Supplier's system.

16.3 Recording and tracking corrective action activity

Develop a form, log, database, or other suitable method to record the required information for a corrective action. The method must clearly communicate the identification, actions and status of each activity. Ensure the system captures the following information:

Reference	The reference or requirement that has not been met. This can be from a product deficiency, customer nonconformance report, internal audit finding, unsatisfied code, specification or contract requirement, or from the Supplier's Quality Manual and procedure documentation.
Observation	The specific product issue/objective evidence item/observation that demonstrated noncompliance.
Correction	Measures taken to eliminate or contain the specific nonconformance
Responsibility	Identify the individual, manager or team assigned the responsibility for evaluating and addressing the situation as a QMS function
Schedule	The timeframe for completion. Due dates for identification of root cause, analysis and action to prevent recurrence.
Root Cause	Identification of the root cause, including contributing factors to ensure appropriate corrective actions.
Actions	Action to eliminate or control the causative factors and prevent a recurrence.
Verification	Verification of implementation and effectiveness of measures taken can predictably lead to closure. When a corrective action is executed, conduct a follow up to verify it was implemented in a timely and effective manner and to ensure the steps taken continue to be effective in avoiding recurrence.
Closure	Document completion of the corrective action process, including name and signature of the person verifying closure of the issue. Include any future plans to verify effectiveness such as the next Internal Audit.

16.4 Review and Monitoring

Identify the responsibility for maintaining the CAR system and monitoring the progress of closing the actions. Prepare a summary of closed and open CARs for assessment at management reviews of the quality system.

Perform adequate root cause analysis and reassessment after implementation of the fix.

Include any closed and open CARs in the scope of the internal audit. This assures that the actions taken continue to be monitored for effective implementation.

16.5 Quality Records

- CARs
- Summary of corrective actions for management review

17 Handling and Storage

Describe the methods for lifting and handling, including assignment of responsible personnel. Include controls for limiting deflection and inadvertent damage during handling. Define storage methods that prevent corrosion from ponding and distortion from settling.

Include provisions for performing and documenting final shipping inspections and controls for preventing delivery of product which has not been final inspected. Describe the method of loading, including securing loads and preventing application of unexpected loads to products resulting from improper loading. Include packaging of loose shipped items as well as structural members.

Address documenting and coordinating final inspections with MDOT QAI. Include bill of lading requirements and identifying product weights.

18 Training

The Supplier must develop a program that defines the documented training requirements for each position. Informal training can be documented by a date or other mark in a table or other simple notation or database or list to assure that personnel at all levels have been informed and training on their responsibility for quality. Training programs define scope and frequency of the training. The program must address initial and periodic training, documentation requirements and special training requirements for quality control personnel.

18.1 Initial and Periodic Training

Ensure personnel responsible for the quality of products and services receive initial and periodic training in their specific job functions. Periodic training is expected whenever there is a change in specific duties or whenever a procedural change in a particular job is implemented, or when industry codes and specifications are updated, or customer requirements change. The Supplier must define the required training for each specific critical position in a procedure. The inspection and testing functions must be included in the defined training plan.

Conduct training using in-house qualified employees or a qualified external source or institution. Assure that the requirements for documenting training are met for each event.

Describe provisions for ensuring personnel maintain understanding and describe how the program focuses on requirements that may be infrequent to the shop schedule. Special meetings, refresher training and specific quality plans may be necessary for jobs or activities that are not part of the Supplier's daily work routine.

18.2 Documentation Requirements

Documented training differs from informal training because it requires training records. Training records include instructor, attendees, course outline and date and an evaluation of attendee comprehension. Include supplemental documentation such as training hand-outs or slides to demonstrate meeting specific subject requirements.

18.3 Quality Control Inspectors

Document training records for inspection personnel. Review the knowledge and qualifications of inspectors periodically to ensure compliance to job qualification specifications or industry code requirement changes. Develop an outline of training requirements by verification activity, listing the

activity, the position assigned and the required training or certification. Required training must be defined in terms of topic and frequency.

18.4 Quality Records

- Training Record (for training performed by in-house instructors)
- Certificate of Completion (for training performed by hired instructors or firms)
- Quality Control/Verification Personnel Training Requirements Outline

19 Internal Audit

Describe in a procedure how internal audits of the QMS are conducted. Audit the requirements of all clauses of this standard at least once a year to verify compliance and effectiveness.

Conduct audits of the entire system at one time, or schedule recurring audits to cover different parts of the system throughout the year. Sections may be scheduled for convenience or by critical importance to the QMS. Identify which personnel are assigned to perform the audit or portions of the audit and how they are qualified to conduct audits in areas other than where they work. Ensure auditors are independent of the functions they are auditing, except for the Executive Manager representing the QMS.

Show in the record generated what clauses/requirements were audited. List the specific position of personnel interviewed, specific documents examined, situations observed, and note any nonconformances. An Internal Audit record with "OK" or check marked without a listing of supportive objective evidence is not acceptable. Review the results of the audit with the management personnel responsible for the efficient operation of the audited requirement or function.

Address how nonconformities are noted during the audit and how they are evaluated to be considered for corrective action. Initiate a corrective action depending upon the severity, frequency and importance of the nonconformity.

Quality Records

- Record of internal audit results
- Internal and external QMS audit records

20 Annex

This Annex is published in a separate document in larger format for easier reading.

20.1 Severity of MDOT audit nonconformances

This is part of the mandatory program rules and supplements Rule J. Nonconformance

20.2 Sample ITP

This is a comprehensive example to aid the Supplier in creating an ITP appropriate for their own supply. It is likely that the Supplier's ITP will be less comprehensive.